

The IPABS Handbook includes attributes that integrate EM business processes and facilitate overall EM project management.

Aspects of IPABS include:

- **Organizing all EM work into EM projects with an associated focus on field project management,**
- **Developing and maintaining Project Baseline Summaries (PBSs) as the primary source of summary project information,**
- **Using performance measures to ensure accountability,**
- **Providing monthly project management tracking,**
- **Developing integrated annual Paths to Closure/Budget Guidance,**
- **Developing and implementing the IPABS Information system (IPABS-IS), and**
- **Supporting EM corporate database to meet IPABS information requirements.**

5. Planning, Formulating, Executing, and Evaluating OST Work scope

The OST program management process provides a structured approach to program planning, formulation, execution, and evaluation. The process incorporates end user input and encourages end user involvement, meets corporate budget request schedules and requirements, promotes effective project management and accomplishment, and ensures sound decisionmaking. The objective of the OST management system is to create needs-driven, solution-oriented research and development activities and products to support completion of the EM cleanup mission.

OST's program baseline is developed within the framework of EM's top-level business processes, which are documented in EM's *Integrated Planning, Accountability, and Budgeting System (IPABS) Handbook*, a project-based management system that is evolving to support the EM Program. The OST management approach is consistent with the IPABS framework, and meets all IPABS requirements as well as lower-level management needs throughout the OST program. The OST Technology Management System (TMS) is an adjunct to the IPABS-Information System (IPABS-IS), which provides specific information about OST technology initiatives and serves as a repository for management-level data and high-level technical information.

The annual EM business process milestones diagram from the IPABS Handbook (Appendix A foldout), depicts the full planning, formulation, execution, and evaluation cycle. The figure presents the steps needed to coordinate OST-related processes with linkages and flows of information required for managing OST and other EM programs. Relative milestone dates for key OST headquarters and field processes and products are illustrated below their respective Month and Fiscal Year Quarter columns. The actual "annual" budget formulation process takes nearly 2 years for a full cycle.

The OST management process develops the necessary information and documentation to support the EM annual business process milestones and provides the framework for the planning, formulation, execution and evaluation of the research and development program. The functions comprising the four major steps of the management process are illustrated in Figure 5.1.

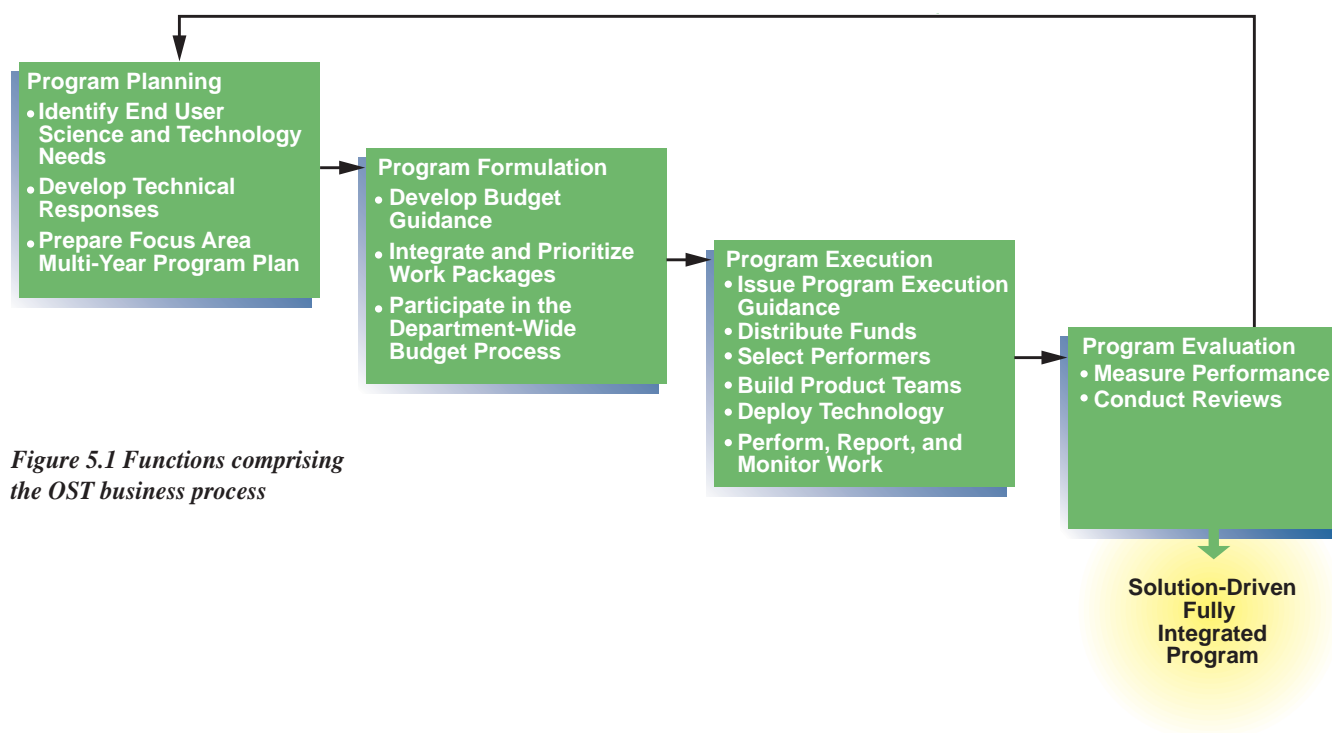


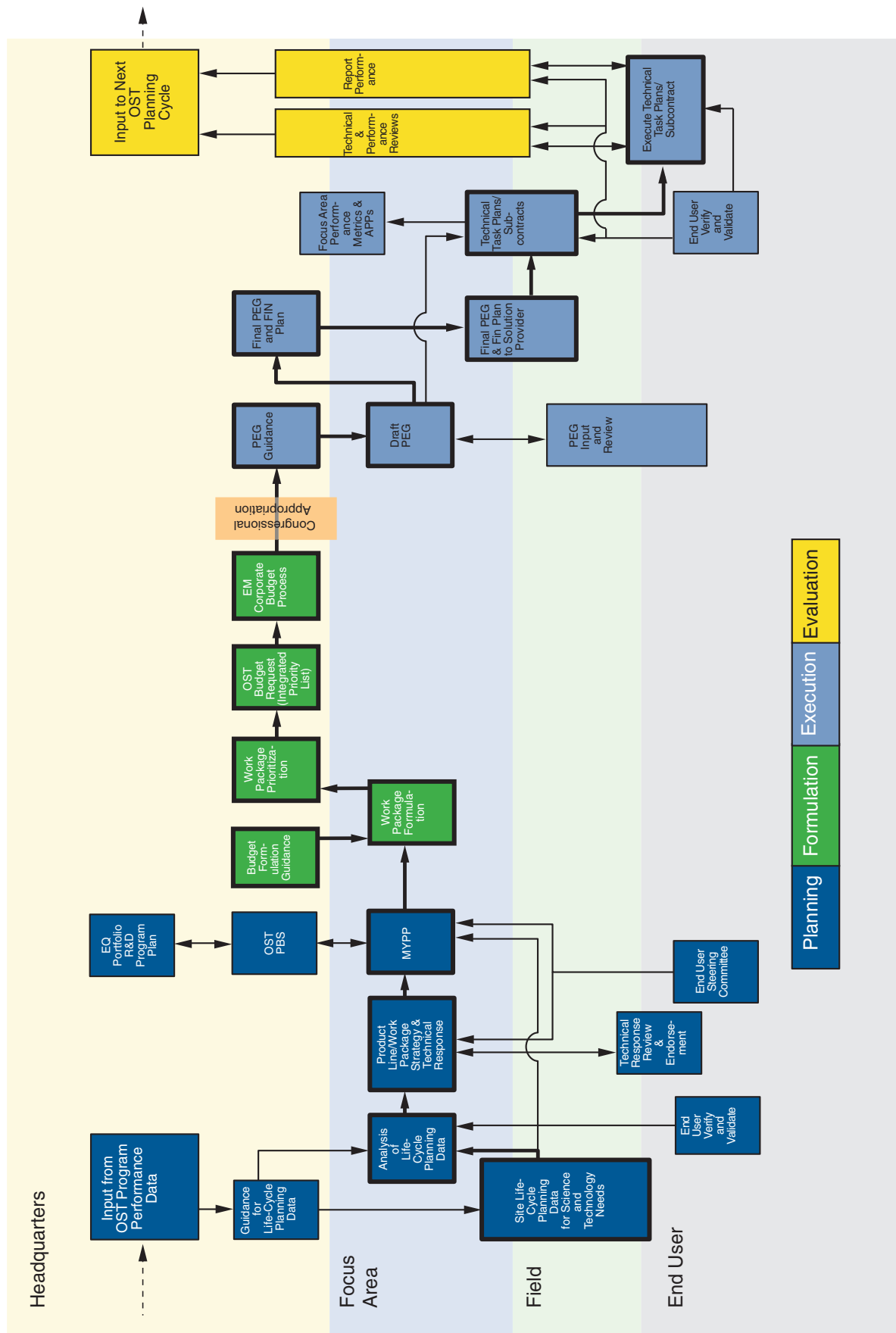
Figure 5.1 Functions comprising the OST business process

EM uses the PBS as the key summary document for planning, budgeting, and managing its work. A PBS summarizes all the life-cycle planning activities of a cleanup project, including the schedule, anticipated budget, description of the type of activities to be performed, future deployments and the identification of technical risk within milestone, waste stream, treatment, storage, and disposal data. All data supporting the development of the PBS are collected and maintained in IPABS.

Headquarters prepares product line baselines and PBSs for OST projects based on the focus area MYPPs. For a given year, the primary planning source for outyear planning estimates is the focus area MYPPs. In September of each year, the focus areas update their MYPPs for use in the subsequent year PBS. OST approves the MYPPs and rolls up MYPP information into the PBSs for the various OST programs. The PBSs are then rolled up into the integrated OST baseline.

The OST program planning, formulation, execution and evaluation cycle is illustrated in Figure 5.2. The figure presents the steps needed to coordinate OST-related processes with linkages and flows of information required for managing the OST research and development program. The OST science and technology investments address direct project-related cleanup needs as well as basic and applied research through EMSP.

Figure 5.2 Planning, formulating, executing and evaluating OST work scope



5.1 OST Program Planning

The primary objective of the planning process is to link potential solutions to the schedule and requirements of the science and technology needs of the EM cleanup-stewardship program. The key outcomes of OST's planning process are the preparation of the focus area technical responses and multi-year program plans. These documents depend upon the identification of a comprehensive and well-defined set of science and technology needs and the subsequent development of a suite of potential solutions. Collaboration between the focus areas, site technology users and the solution providers is critical to creating interfaces that expedite the development and implementation of appropriate science and technology solutions.

Identifying Site Science and Technology Needs

The fundamental requirement for developing a needs-driven research and development program is the identification and definition of the science and technology needs of the sites. To ensure that the program also remains solution-oriented, the end users must be involved in defining the requirements that potential solutions must meet to fill a need. The OST program depends upon the site end users and site technology coordination groups to identify the science and technology needs and requirements to be used as the basis for program planning. These needs are documented in needs and opportunities statements that are prepared in response to an annual data call to the field. The end user needs also reflect stakeholder values as a result of their participation in establishing site-specific compliance agreements and identifying site needs.

The EM cleanup project PBSs are a primary source of information for identifying end user needs. The PBSs are prepared or updated annually. They summarize EM project planning, budgeting, execution, and evaluation data. The analysis of this data results in additional documents that also help identify needs and opportunities.

This information provides the fundamental basis for developing focus area technical responses.

Developing Technical Responses

The technical responses are the building blocks for constructing the OST research and development program. The focus areas, using input from end users and research and development performers, prepare the technical responses. A technical response is a proposed solution to a science and technology need or group of related needs. The requirements and constraints a potential solution must address must be well defined in order to develop comprehensive, effective technical responses. The focus areas facilitate a dialogue with end users, regulators, stakeholders and the research and development performers to identify and define all the requirements and issues that must be considered. The technical responses become the basis for the focus area's strategy for addressing specific site and end user needs.

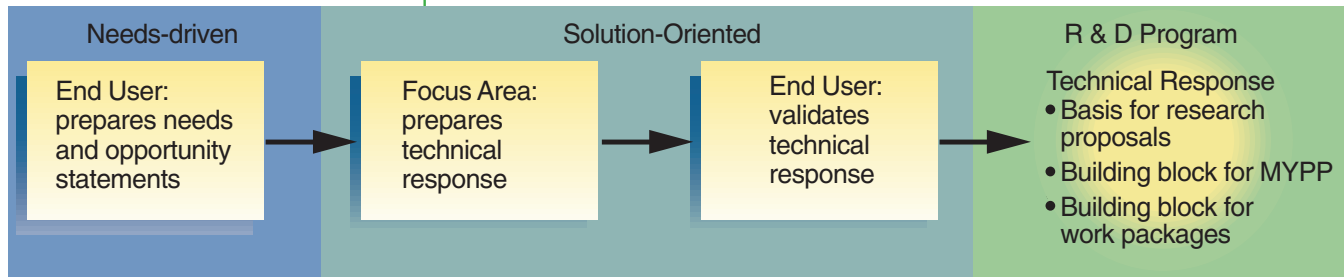
Primary information sources for identifying science and technology needs:

- **PBSs, which summarize scope, technical approach, schedule, life-cycle cost, and environment, safety, and health risks;**
- **Disposition maps, which illustrate the maturity of the technology baseline;**
- **Critical Pathway Analysis, which provide an understanding of the maturity of the technological solution linked to the risk associated with key activities and events in the path to site cleanup;**
- **Site Treatment Plans and Consent Orders, which establish the regulatory requirements associated with cleanup project completion; and**
- **Programmatic and Technology Roadmaps, which provide insight into programmatic and technology factors and considerations.**

A comprehensive technical response considers:

- **Environmental risks**
- **Regulatory requirements**
- **Waste stream types and quantities**
- **Disposition of treatment residues**
- **System processing rate requirements**
- **Stakeholder issues**
- **Programmatic risks**
- **Alternative technologies**
- **Technology performance requirements**
- **Technology availability, maturity and acceptability**
- **Ongoing projects and potential new work**
- **Commercialization potential**
- **Cost**
- **Schedule**
- **Environmental, safety and health factors**

Figure 5.3 *Developing needs-driven, solution-oriented technical responses*



All technical responses are reviewed and validated by senior EM management and the site end users to ensure that the proposed solution actually meets the identified need and can be integrated into the project. Throughout this integration process, joint planning ensures that budgets support the development efforts, that schedules line up with technology insertion points, and that the cleanup projects have the financial resources and technical support necessary for implementing and deploying new solutions.

The needs identification and technical response development process is designed to ensure that the research and development program is needs-driven and solution-oriented, as is illustrated in Figure 5.3. A technical response must have end user endorsement to advance through the remainder of the planning and formulation process.

Research and development performers propose projects to create the solutions described by the technical responses. The proposals specify work scope, estimated cost, schedule, and performance milestones. Each focus area evaluates the proposals, compiles individual proposals into work packages, and plans a national program. Proposed projects are documented in the Technical Task Plan format for subsequent use in the formulation and execution steps. “Make-vs-buy” decisions are appropriate at this point in the planning process, determining if the necessary solutions, technological innovations, and scientific and technical expertise exist within the DOE complex or are to be found external to DOE. The focus areas and their lead laboratories must remain current on the “state-of-the-art” in their problem area to effectively facilitate these decisions and to ensure that the best technical responses are identified.

Multi-Year Program Planning

The focus areas develop their multi-year program plans (MYPPs) based on the technical responses. Related technical responses are combined into projects that address specific problem area needs, illustrated in Figure 5.4. Projects are similarly grouped into product lines, constituting major programmatic elements of a focus area program. The full set of focus area product lines comprises the focus area MYPP.

The MYPPs are compilations of individual projects into related sets of well-defined technical or programmatic activities designed to provide science and technology solutions to site cleanup-stewardship programs. The MYPP describes the planned research and investments of the focus area over the next five years. As part of the planning process, the technical responses and projects are prioritized as they are integrated into the MYPP. Each focus area selects and prioritizes the projects incorporated into their MYPP according to specific criteria and processes. The prioritization criteria reflect six major factors.

Technical response prioritization factors:

- Technology maturity,
- Project relevancy,
- Needs,
- Schedule,
- End user endorsement, and
- Cost.

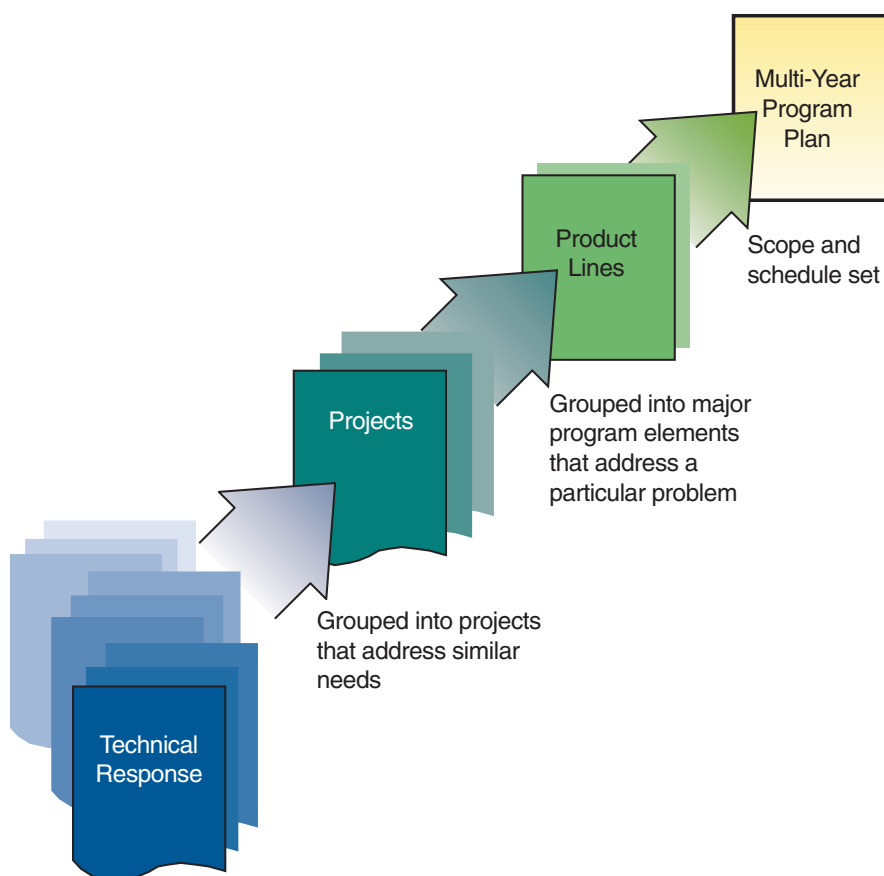


Figure 5.4 Compiling technical responses into an MYPP

An MYPP describes the technical program of the focus area in terms of product lines and projects. For purposes of budget formulation, similar or related projects are grouped into work packages. Work packages detail problem sets, plan technical investments, establish performance measures, and describe the anticipated outcomes of those investments. Both site cleanup project managers and the science and technology community use them for planning purposes.

5.2 OST Program Formulation

The focus area MYPPs and work packages are the basis for OST's budget formulation process. Work packages describe the scope of work that can be accomplished at a given budget level, providing a basis for evaluating funding distribution impacts. OST prepares a budget request to meet as many high-priority program objectives as possible. Functions within the program formulation process include development of budget guidance, prioritization of work packages within each focus area, integration and prioritization of work packages across focus areas, and participation in the DOE-wide budget process.

Developing Budget Guidance

Annual budget guidance is issued from the DOE Chief Financial Officer and Chief Information Officer. Guidance includes funding targets and requirements for each program secretarial office. Based on this guidance, EM issues budget formulation guidance and requirements to EM programs. OST, in turn, issues guidance for items unique to OST budget formulation needs. The guidance includes funding targets for each focus area, OST national prioritization criteria, OST corporate strategy and performance goals, and format requirements.

Focus Area Work Packages should include all aspects of developing a solution:

- **Applied Science,**
- **Development,**
- **Demonstration,**
- **Deployment,**
- **Technical assistance, and/or**
- **Support.**

Work Package Preparation

The focus areas perform a series of activities associated with work package preparation and submission for the budget formulation process. A work package is a grouping of similar or related projects focused on a single major problem, as illustrated in Figure 5.5. It describes the logic and time frame to achieve solutions to the problem, typically in a three- to five-year time frame. A work package addresses only one product line within the focus area and typically represents a \$3M to \$5M annual research and development investment. The technical scope for the budget fiscal year is defined and cost estimates are prepared and documented for projects in the work package based on the data in the focus area MYPP. Request-for-proposals (RFPs) are prepared for new work that will be initiated and the appropriate segment of the research and development community to which the RFP should be advertised is identified. Work associated with ongoing projects is reviewed to confirm that it is still relevant to an end user need, is still on schedule, and still represents a potential solution that is being requested by an end user. All the conditions and review criteria must be positive for the work to be recommended for continuation.

The work packages must be prepared and documented in a straightforward, defensible manner to facilitate progression through the budget formulation process. An important aspect of the preparation and documentation is a description of the benefit that will result if the work package is funded and the impact that will occur if the work package is not funded. This information supports justification of the work package and provides a basis for comparison and integration with other work packages.

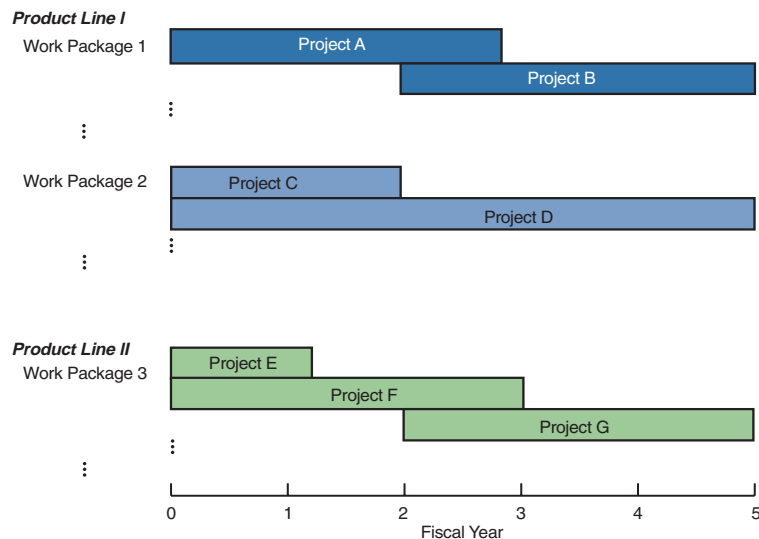


Figure 5.5 The relationship of product lines, work packages and projects

Integrating and Prioritizing Work Packages

OST uses the Work Package Ranking System to normalize, compare and prioritize the work packages from all the focus areas into the OST integrated priority list (IPL). The ranking system is a multi-objective decision analysis scoring system that assigns a relative, numerical value describing the potential value of a work package based on five ranking factors. OST uses the ranking system to help senior EM decisionmakers make informed research and development investment decisions. The result of the national prioritization process is an OST IPL of all the work packages submitted by the focus areas. EM deputy assistant secretaries and DOE field office managers review and approve a final priority list that becomes the basis for the OST budget request.

Work Package Ranking System ranking factors:

- ***Site needs,***
- ***PBS impact,***
- ***Future technology deployments,***
- ***Technical risks, and***
- ***Potential technology cost saving.***

Participating in the Department-Wide Budget Request

OST presents its proposed budget and IPL at the annual EM Corporate Forum. A budget request that reflects final EM decisions is then forwarded to the Department CFO for consideration. Following Departmental review and decisions, the EM/OST budget is submitted to the Office of Management and Budget (OMB). After the OMB review and appeal process is completed and final budget allowances are provided to the Department, the EM/OST budget is submitted to Congress. Throughout the entire budget process, additional information is provided in response to questions and inquiries (from EM, the Department, OMB, or Congress) and to further justify and defend the OST budget request. The OST focus areas are kept informed of developments throughout the budget process, including the congressional appropriation process (e.g., hearings, markups, and conference).

5.3 OST Program Execution

The administrative aspects of OST program execution consists of issuing guidance and approving work, distributing funding, reporting and monitoring work performance, and controlling changes to approved baselines.

Defining Work Scope and RFPs

During the preparation and submission of work packages, the focus areas also began preparation of RFPs for new work scope and definition of work scope, budget and schedule for ongoing work. When the budget is allocated the focus areas finalize the RFPs and update the scope, schedule, and budget for specified tasks that are within the funded work packages. Program Execution Guidance (PEG) is then drafted to describe the work to be executed during the fiscal year.

Issuing Program Execution Guidance

The focus areas negotiate the work scope and funding for each technical task plan (TTP) activity through iterative negotiations with the research and development providers, along with inputs from the focus area User Steering Committees and the TPO at the sites. The focus areas then prepare and submit a draft PEG for each work package to headquarters for final review and approval. Each draft PEG includes performance measure tables, funding tables, and management briefings. OST work authorization is prepared in accordance with DOE Order 412.1, “Work Authorization System.”

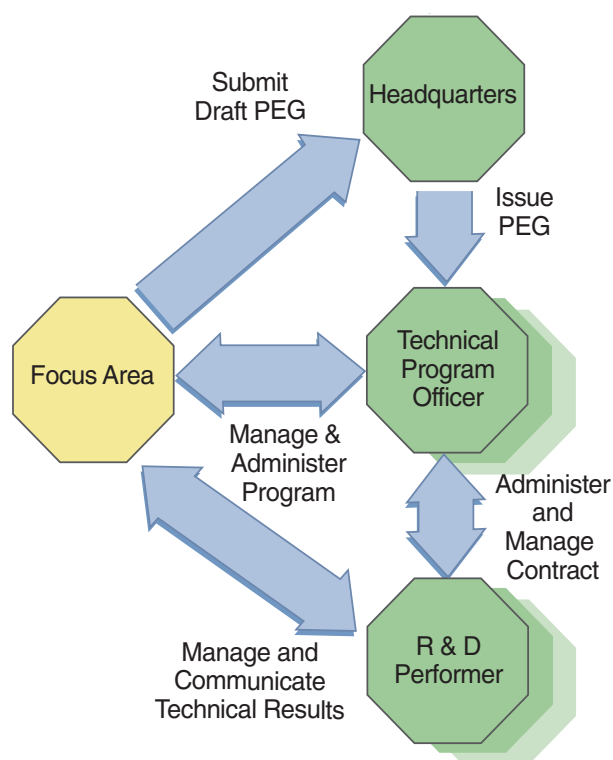


Figure 5.6 The PEG development and execution process

OST procurement practices ensure full and open competition, bringing the best resources available to bear upon site science and technology needs.

Headquarters issues the final, approved work authorization to the field office TPOs. The TPOs and the focus areas iteratively prepare TTPs. These documents provide the specific work scope, funding profile, schedule, milestones, and deliverables against which work performance and progress will be evaluated. A TTP serves as the contract between the focus area and the performer for the work scope to be performed during the fiscal year. The TPO administers the project for the focus area. The complete process and interfaces is illustrated in Figure 5.6.

All planned work for the upcoming fiscal year is communicated via the PEG. Collection, analysis, and reporting of all PEG-related information are tracked through the Project Execution Module of IPABS. The final PEG and Approved Funding Plan (AFP) are provided to the principal investigators for preparation and update of the TTPs. This information is also the basis for developing each focus area's Annual Performance Plan (APP) which includes planned deployments, demonstrations, and technologies ready for implementation along with cost and performance data. The project is authorized to start when the TTP is approved and funding is allotted to the contractor through the AFP. TTP preparation and approval processes are described in focus area-specific MYPPs.

Distributing Funds

Headquarters allocates funds to specific field offices and contractors through the AFP, issued monthly by the Chief Financial Officer (CFO).

The AFP allots funds available for obligation and expenditure and also establishes the framework for reporting financial data and technical progress. Thus, although the focus areas manage the technical work and work scope, funds are allocated directly from headquarters to the field offices and are administered by the TPO at the site.

Most OST projects are continuations of prior-year efforts. However, new work scopes may be identified and proposed during the planning phase. Each focus area assesses the nature of the work, private sector capabilities, and expertise available with the national laboratory system, to determine the most advantageous approach to having the work performed. It is OST's goal to compete every possible item of work (from basic research through deployment) that would benefit from competitive procurement.

Selecting Performers

The focus areas are responsible for integrating research and development activities conducted by the national laboratories, DOE site contractors, industry, universities, and other private sector research organizations. Procurements are processed through a centralized procurement office to maintain consistency across the EM complex and procurement practices are used that ensure full and open competition.

Before a procurement action is taken, the focus area must first determine whether the desired product or service is to be made with in-house DOE resources or procured from the private sector. This make-or-buy decision establishes the type of procurement award action that will be made. For a product or service made in-house, the activity is tasked through TTPs with the DOE sites.

If the product is to be procured from an outside private sector or university source, either a competitive contract or a financial assistance procurement action is taken. OST primarily uses the following procurement techniques for competitive contracts:

- Specific requests for proposals (RFPs) for basic and applied research, development, demonstration and deployment projects;
- Broad solicitations for basic and applied research and other development projects designed to acquire the best approaches to program and research areas, including research opportunity announcements issued annually, program research and development announcements, and program opportunity announcements; and
- Support services, for both headquarters and field support, to assist with the national program to conduct basic and applied research, technology development, and deployment assistance.

Procurement actions are initiated in three primary areas: basic and applied research; technology development, demonstration, and testing; and accelerated technology deployment.

Basic research procurement actions are generally initiated through the EM Science Program at the DOE Idaho Operations Office and are normally in the form of financial assistance consisting of cooperative agreements and grants. Analogously, applied research calls and industry solicitations are administered annually by the National Energy Technology Laboratory (NETL) on behalf of the focus areas. The process for the submission of applications is published in *The Federal Register*.

Technology development, demonstration, and testing typically involve solicitation from industry and universities in the form of either contractual awards or financial assistance. The solicitations are generally conducted through NETL, resulting in contracts, cooperative agreements, or grants.

Accelerated technology deployment involves performed through a multi-site competitive award program under the Accelerated Site Technology Deployment Program at the DOE Idaho Operations Office. The purpose of this program is to gain regulatory acceptance, provide technical assistance, and provide an incentive for field office use of innovative technology.

Ensuring Deployment—Involving End Users, Regulators and Stakeholders

Focus areas create appropriate integrated product teams to ensure that solutions resulting from the focus area research and development activities are deployed by end users. The product team helps ensure that technology development is focused on the primary site-specific problem while also maintaining the potential for deployment at other sites in the future. A product team includes the technology end user from the primary deployment site and, if possible, users from secondary deployment sites; the science and technology developer; appropriate OST site team representatives and deployment assistance team representatives; key stakeholders from the state and regulatory agencies involved; and a representative from the Interstate Technology and Regulatory Cooperation (ITRC) Working Group.

Focus Areas create integrated product teams to ensure science and technology solutions are deployed at the sites.

Product teams are also intended to provide information to regulators and state representatives about upcoming technologies to facilitate regulatory acceptance during deployment. For example, the ITRC Working Group helps regulatory agencies and technology developers, vendors, and users reduce the technical and regulatory barriers to the deployment of new environmental technologies.

Ensuring That Technologies Can Be and Are Used

The ultimate measure of success of OST research and development investments is that science and technology solutions are implemented and deployed at the sites. The focus areas have responsibility not just for the development of science and technology solutions, but also for facilitating the deployment of these solutions by EM and users. Within the Office of Technology Applications the Deployment Assistance Team provides processes and support to accelerate and increase the deployment of new technology and the delivery of key products to site customers. It is the responsibility of the focus areas, however, to have processes in place to make the assistance and support accessible and available to the end users. The objectives are to:

- Reduce the time from successful demonstration to first time deployment,
- Increase the percentage of technologies that are deployed,
- Reduce the time from the first time deployment to incorporation into a site baseline,
- Increase the multi-site use of new technologies, and
- Achieve 100% of milestones associated with critical product delivery.

Technology deployment assistance is provided through several different approaches. End user commitment to deploying new technologies is obtained by implementing requirements for joint funding between OST and end users and by joint planning with the end users. OST may, in instances where successful deployment depends on nontechnical issues, provide funding to support safety assessments and training to facilitate the deployment of a new technology. Inclusion of representatives from the Innovative Technology Research and Demonstration (ITRD) process and the ITRC Working Group on integrated product teams facilitates broader communication of available technologies. Finally, emphasizing the commercialization potential of a new technology may increase the rate or scope of deployment.

In addition to deployment assistance, OST provides direct technical assistance on key technologies or critical products. Technical assistance is made available to the sites for reviewing, selecting, implementing or troubleshooting a science or technology deployment. Technical assistance may be required to facilitate OST's ability to understand and work with external influences, including stakeholders, regulators, unions, industry, and other federal agencies. This includes coordinating efforts with other federal agencies that can contribute to either increased or accelerated technology use; coordinating with the sites and industry (companies and trade associations) to improve site access to, and use of, commercially available technologies; and coordinating with unions, regulators, and stakeholders, as appropriate, regarding the use of new technology and key products.

Administering Work

OST work is performed in accordance with the schedule, scope and budget in each TTP and the funding authorized in the AFP. The focus area and TPOs work together to ensure projects are implemented according to the AFP and TTP. The TPO has responsibility to obligate funds, track performance and report progress in IPABS. The focus area is responsible for the technical execution of the project. All OST program participants are responsible for performing work in accordance with applicable environmental, safety, and quality requirements of DOE Order 5400.1, DOE Order 451.1A and DOE Order 5480.19. Additional information on environmental, safety and health and quality assurance requirements and guidance is provided in Chapter 6.

As work is performed, the program manager monitors cost, schedule, and project performance. The TPO oversees task performance and coordinates the submission of reports to headquarters and the focus areas. The focus area and program managers work closely with the TPO and technology developers to identify issues and develop remedies to ensure that work is performed effectively and that the technical solution under development meets established objectives.

The TPO and focus areas review project cost and schedule on a monthly basis as part of the project management process. Cost, schedule and scope data are rolled up quarterly in an IPABS report that is reviewed by headquarters. Headquarters performs a quarterly business review to evaluate performance at both the focus area and TPO level. Performance analysis and progress reporting during program execution are key elements in deciding to continue work and to allocate future funding.

Controlling Baseline Changes

Change control is an important part of program and project management. Programs are continuously monitored to improve programmatic effectiveness and efficiency. As defined in the overall EM Program Change Control Charter, change control procedures must align and link program planning, budget formulation, program and budget execution, and program evaluation with a view on results. These requirements are described in the IPABS Handbook. Consistent with this, the OST change control procedures and a headquarters OST Change Control Board are in place to ensure that change, redirection, and decision impacts are tracked and managed.

The need for change control is found at all levels of the OST business process and documentation including:

- OST life-cycle project baseline summaries,
- Focus area multi-year program plans,
- Program execution guidance current year baselines, and
- Field technical task plans.

OST uses a change control process that is unique to OST but is consistent with EM, to review and manage all changes. The OST change control process is based on financial and work scope impact of the proposed change. Work scope changes, such as milestone adjustments, that occur without corresponding financial changes are jointly approved. Further, some changes are subject to baseline change control by the focus areas, with headquarters involvement only if thresholds are exceeded. During program execution, work scope and funding changes are grouped by category and processed as outlined in Table 5.1.

Change Category	Change Criteria	Approval Authority
I	<ul style="list-style-type: none"> • Change directed by DOE headquarters or Congress • Impacts to the focus area technology/needs matrix, and/or performance metrics, and/or other technical criteria • Impacts to more than one focus area due to increases/decreases to a focus area's authorized budget • Financial changes to deployment projects • Any termination of a project or contract 	Associate Deputy Assistant Secretary for Science and Technology (EM-50)
II	<ul style="list-style-type: none"> • Change <i>exceeding</i> \$100,000 or 10% of a specific focus area's authorized budget for a Technical Task Plan (TTP) • Impacts more than one site • Impacts more than one TTP within a specific focus area • Impacts the focus area lead site's controlled milestone • Does not meet any of the criteria listed in Category I 	Field Focus Area Manager
III	<ul style="list-style-type: none"> • Change <i>less than</i> \$100,000 or 10% of a specific focus area's TTP budget and does not meet any of the criteria listed in Category I or II 	Technical Program Officer

Table 5.1 OST baseline change control thresholds

The formal EM Headquarter Change Control Charter is followed for those changes exceeding the EM threshold limits. Additional EM change control requirements are described in *the Integrated Planning, Accountability, and Budgeting System Handbook*. Specific OST baseline change control thresholds are described in Table 5.1.

5.4 OST Program Evaluation

Program and project review and evaluation are used by OST to measure performance and identify problems or issues, provide feedback for program improvement, and provide information of management decisions and planning activities. Reviews facilitate and support decisionmaking at all program levels and throughout the technology maturation and deployment process.

Measuring Performance

OST employs performance metrics to measure the impact of EM's investments in research and development and how effectively cleanup project managers are using

scientific advancements and new technologies to execute their projects. In defining performance measures for each program level, OST emphasizes metrics that are directly related to cleanup project accomplishments and demonstrate progress toward improving site baselines.

A key instrument in measuring OST performance is the focus area Annual Performance Plan (APP). The APP is intended to ensure OST's funding accountability and, therefore, documents each program's performance indicators, milestones, and deliverables. APPs specifically identify the following three measures for the EM development and deployment of innovative cleanup technologies:

- Number of demonstrations of technologies that meet performance specification-based needs identified by the site technology technical group,
- Number of technologies made ready for implementation with cost and engineering performance data, or
- Number of deployments of alternative technologies in cleanup projects.

At a higher level, APPs represent agreements on the work to be performed and the results to be accomplished. The focus areas should also identify their own "stretch goals" in the APP in the categories of cost savings, technical assistance provided, and number of deployments. In addition to these specific measures, the APPs establish goals and thresholds for cost performance, schedule performance, and milestone completion. These are tracked through data reported in the IPABS Project Execution Module and presented during business reviews. Evaluation of cost and schedule status helps ensure progress is being made within the established baseline.

In addition to the APPs, the focus areas also use a 360° evaluation process to evaluate their performance from the perspective of "customer satisfaction". This evaluation provides valuable feedback to help measure focus area performance effectiveness and to provide a basis for continuous improvement.

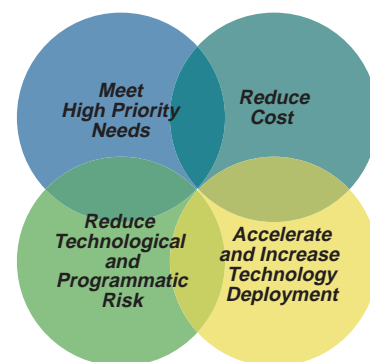
Within EM, a tiered planning and performance measurement system is used to develop the APPs. The highest level is incorporated into the Secretary's Performance Agreement with the President, as prescribed by GPRA. Intermediate performance measures and plans are established for program areas and field elements. OST performance measures include the number of deployments, demonstrations, and technologies ready for implementation with cost and performance data. Performance measures for EM's investments in research and development address both the performance of individual investments and the success of the overall program.

To properly monitor performance of research and development investments, four corporate performance measures have been developed. EM uses these performance measures at the corporate level to evaluate the impact of investments in research and development and to determine how effectively cleanup project managers use advances in science and newly available technology to execute their projects:

Reduction in the cost of cleanup as described by the achievement of EM's accelerated cleanup goals. EM reviews, on a site-by-site basis, by cleanup project, cost reduction in attaining cleanup goals and what portion of the reduction is attributable to specific investments made by EM in research and development.

Technology deployment as an output measure to evaluate, by project, how many of the new technologies are provided as a result of EM's investments and what impact those technologies are having on cleanup projects.

EM Program Critical Objectives



Investments against, and solutions to, high-priority needs are a measure of the responsiveness to cleanup project managers and the ability to effectively manage EM science and technology investments. EM measures both the numbers of high priority needs being addressed and the success in meeting those needs.

Reduction in technology risk will ensure the success of cleanup plans, reduce cleanup costs and allow the evaluation and tracking of investments in areas where baselines have technology gaps or uncertainties. EM annually evaluates how science and technology have lowered technology risk levels. This evaluation includes both science and development developed through EM's investments as well as externally developed research and development brought to bear on EM's cleanup problems.

These four corporate-level performance measures are evaluated, documented and reported by the site cleanup project managers. The results help EM managers determine the impact of investments in research and development. They will also be used to modify and improve the investment strategy to continually increase the effectiveness of the research and development investment portfolio.

At the OST level, two performance measures are used to manage and evaluate the productivity of the focus areas. These OST-level performance measures are:

- Effectiveness in moving from scientific principles and concepts to well-defined, demonstration-level technologies, as measured by the number of demonstrations, and
- Effectiveness in moving technologies from demonstration to readiness for use, as measured by the number of technologies, with cost and performance data, available for implementation.

Conducting Reviews

Reviews create the foundation for program and project evaluation. The overall purpose of OST reviews is to obtain knowledgeable assessments of the progress and performance of ongoing activities or programs and of the potential value of proposed activities, and to document both the review and the actions taken in response to the review. The feedback provided by reviews is the basis for corrections and improvements in the program. OST reviews are conducted at three distinct levels: (1) high-level reviews, (2) programmatic reviews, and (3) project selection reviews (Table 5.2).

While the exact goals, methods, and emphasis of various levels of review are somewhat different, certain attributes are consistently important in all reviews. Reviewers are briefed in advance regarding the purpose and criteria against which projects are to be evaluated. In addition to these attributes, reviewers are expected and encouraged to address additional issues deemed pertinent to the overall program.

Reviews are founded upon principles of scientific ethics and conform to the following set of basic guidelines:

1. Reviewers should have documented expertise in the subject matter and experience in the area being reviewed.
2. Reviewers must be free from any direct interest in the outcome resulting from decisions that draw upon their advice or comments. In addition, integrity on the part of the reviewers is demanded to ensure that they not improperly use information contained in confidential or privileged documents.
3. Individual members of review teams, and specific review comments are matters of record and are to be available, but the identity of reviewers making particular comments is strictly confidential.

Table 5.2 Levels of OST review

Level	Reviewers	Requested by
High-Level Reviews Policy Issues Broad Program Concerns Technical Areas (e.g., HLW vitrification)	EMAB NAS-NRC Others	EM Headquarters
Programmatic Reviews Midyear Reviews	Focus Areas & End Users	Headquarters
Project Selection Reviews Basic & Applied Research Technology Deployment & Demonstration	Office of Science & Focus Areas Technical Peer Reviewers & End Users	Focus Areas

4. Where a team recommendation is formulated through discussions among reviewers, the review team must be constituted under the rules of the Federal Advisory Committee Act (FACA). Non-FACA reviews reflect only the comments of individual reviewers.
5. Review comments and recommendations are formally directed to the next higher level of authority than the one being reviewed. For example, reviews of specific projects are reported to focus area management but reviews of the focus areas themselves are reported to the directors of the headquarters Offices of Basic and Applied Research, Technology Development and Demonstration, and Technology Applications.
6. Reviewers do not have authority for making decisions and are not responsible for their outcome. Such authority and responsibility belong to the appropriate federal program manager and OST management.

Headquarters requires that all reviews culminate in written documentation and may require an action plan to delineate steps to correct deficiencies and take advantage of new opportunities. Program and line managers consider information acquired from reviews in selecting or continuing projects for funding, for developing new areas of investigation, and for evaluating programmatic progress. Such information is also used to document the progress and productivity of OST programs in reports to DOE senior management, Congress, and the public.

Basic criteria of a review

- **Endorsement by potential EM users**
- **Importance of the problem being addressed and the solution cost vs. benefit performance compared to baseline**
- **Solving problems for which no baseline exists or delivers a step improvement over baseline**
- **Solution has scientific and technical merit (it is good science)**
- **Readiness for a technology to advance to a later development stage**
- **Avoiding unnecessary redundancy**
- **Feasibility and likelihood of technical and economic success**
- **Performance record of the proposing institution and investigators.**
- **Safety and health issues are appropriately addressed**

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Reviews of OST

High-level reviews are most often conducted by the Environmental Management Advisory Board (EMAB) or the National Academy of Sciences-National Research Council (NAS-NRC). Such reviews address issues of broad program initiatives and help guide OST in addressing problems of greatest significance to EM and DOE. High-level reviews are typically initiated on an *ad hoc* basis at the request of EM or OST. Major program areas (e.g., applied science) or technology groupings (e.g., thermal treatment, subsurface barriers) may be reviewed. Reviews by EMAB or NAS-NRC are usually reported to EM, and EM drives actions that result from the review.

Other high-level reviews may be carried out within a focus area. For example, solution development laboratories, as a matter of good engineering design practice, conduct major system and subsystem reviews. Conceptual, preliminary, final, and readiness reviews are carried out for major projects. These reviews are chaired by the requesting focus area management and have independent review personnel.

Reviews by the Focus Areas

Focus areas carry out programmatic reviews as needed to evaluate technical and business management aspects of work packages and projects. The most important programmatic reviews are those required at midyear because of their role in the annual budget cycle. Midyear reviews combine the attributes of independent, end user technical evaluation, programmatic status reviews, and forward-looking vision. Each focus area conducts annual midyear reviews according to consistent general guidelines adapted to its goals and methods. The principal focus of midyear reviews is user endorsement and progress toward meeting user requirements. Midyear reviews also expose ongoing work to other potential users, and guide current year adjustments. Progress and readiness of each project for advancement through maturity stages are identified and documented. Technology maturity reviews are documented as a part of the midyear review report.

The rate and stage of technology maturation are fundamental aspects of measuring the performance of the research and development program. Since 1995, OST has used a technology maturation model to describe and measure these parameters. The model, illustrated in Table 5.3, describes each stage of technology maturity and provides criteria for determining when a project has progressed from one stage to the next. The model is applicable for technology that is developed in a linear manner. OST recognizes that a nonlinear model is also appropriate—in some instances breakthroughs may bypass stages in the model or conversely, new information may require a return to an earlier stage or basic research may be required to support progress at a later stage. Nonetheless, the model has been found to be very useful for OST program evaluation and planning.

Focus areas assess the maturity of each project at least annually as a part of the midyear review and document the results in the midyear review report. A standardized checklist that addresses criteria in seven categories (Figure 5.7) used to identify project maturity, completed as part of the review, is included in the report. Focus areas maintain documentation backup for the checklist for each active project. Fully matured technologies are deemed “ready for implementation,” and readiness is signified by publication of an Innovative Technology Summary Report, which contains cost, performance, safety, and other information, that a potential user requires in deciding to deploy the technology.

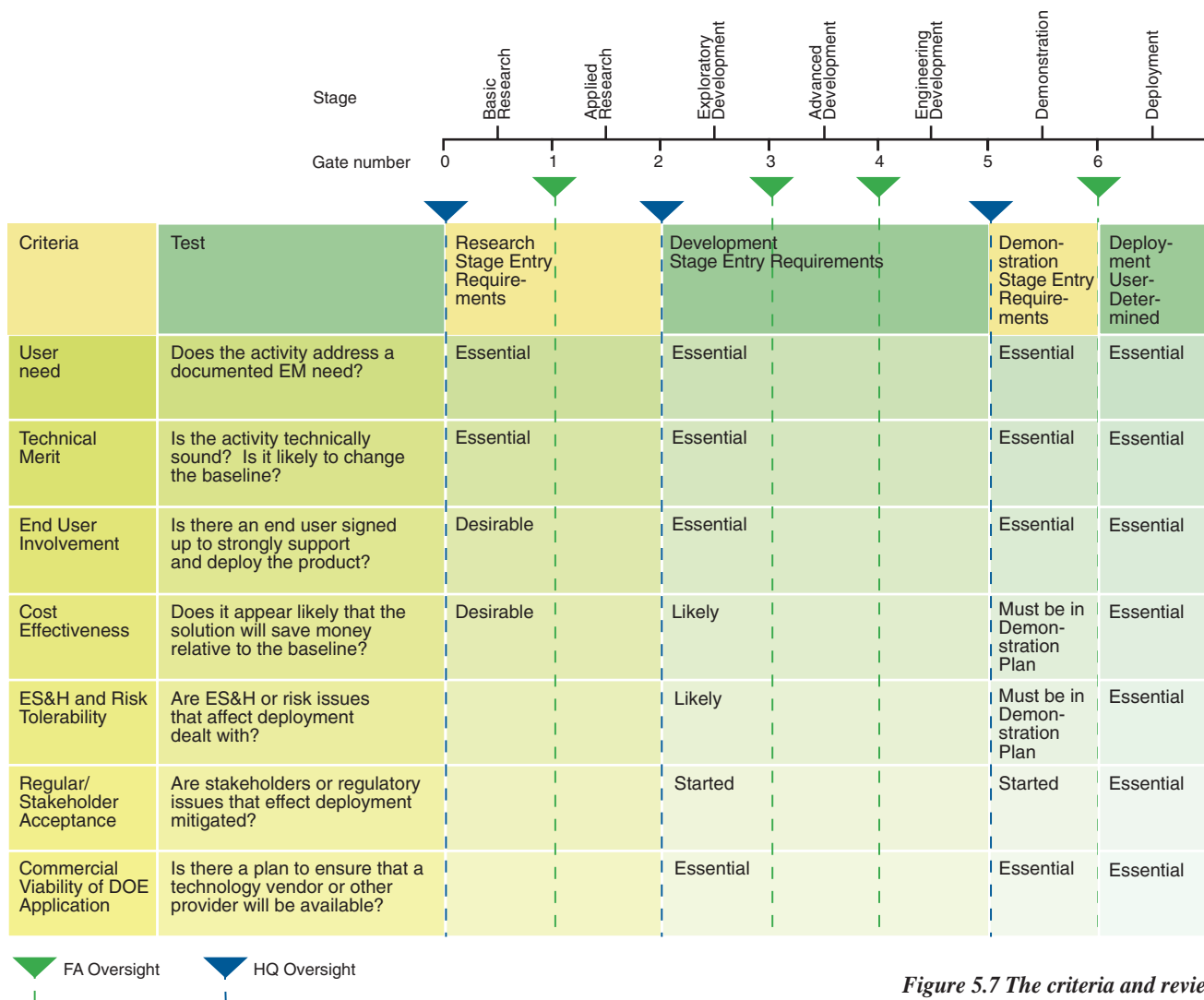


Figure 5.7 The criteria and reviews to assess technology maturation process

Project Selection and Peer Reviews

Focus area leaders and EMSP managers use project selection reviews to assist in determining what projects to support. Although project selection reviews are similar for proposed projects at all maturity stages, reviews for basic and applied research differ slightly from reviews for technology development and demonstration. Reviews at all stages combine judgments by technical peers and by potential users of the results.

Basic and Applied Research Project Selection Review– For basic and applied research, the EMSP solicits preproposals, which are reviewed by a committee of technical, focus area and end user representatives. The results of this review are used as the basis for encouraging full proposals. When full proposals are received, they are first peer reviewed for technical merit by external review panels selected by the Office of Science and then for potential applicability to EM problems (relevance) by review panels of end users and EM focus area members.

Prior to funding, all basic or applied research projects (Gates 0 or 1) are reviewed for technical merit by the Office of Science, and then for potential applicability to EM (relevance) by review panels comprised of end users and EM focus area members.

Peer reviews are conducted:

- **Prior to selection as a new project,**
- **Prior to transition from research to development, or**
- **Every three years for projects not reviewed for other reasons.**

Development and Demonstration Project Selection Reviews– New technology development or demonstration projects are identified in the work package prioritization process and performers are selected based on an objective and credible process. First, focus areas apply “make-or-buy” decisions, utilizing, where possible, solutions that already exist or are readily adaptable. On the other hand, some problems are unique to DOE and, therefore, require unique solutions. While the proportion of already available solutions is different from one focus area to another, and the balance of “make” versus “buy” decisions differ accordingly, the rule of “buy-before-make” is consistently observed where appropriate solutions exist. The focus area then determines if it is necessary to compete the performer selection among the entire DOE laboratory system, a selected subset of DOE laboratories, other government laboratories, industry or universities and then issues the appropriate solicitation. The resulting proposals are subjected to technical peer review for scientific merit and to end user evaluation of programmatic relevance. Solicitations to universities and industry follow the review procedures as outlined by the *Federal Acquisition Requirements* (FAR).

Peer reviews seek the counsel of external experts to assist managers in evaluating project technical quality. Peer reviews are coordinated for OST by the Chicago Operations Office (CH). A peer review coordinator at CH works in partnership with the headquarters review manager to carry out technical peer reviews on projects that meet one of the three conditions described in the text box. Four types of peer reviews may be conducted as appropriate to the scope and complexity of the decision being supported (Table 5.3).

Core criteria for each type of review are specified in the implementation guidance. Focus areas request the peer review coordinator to perform peer reviews on specified projects. Focus areas designate the type of review and may specify added review criteria or other issues to be addressed as part of their request for a review.

Table 5.3 Levels of peer review

Review Type	Description	Performed by
Type I: Multi-Technology Review	The review panel consists of five or more individuals who will perform a review of several related technologies or a complex project containing multiple technologies. Principal investigators are required to present their proposal or progress.	Convened panel
Type II: Single Technology Review	The review panel consists of at least three individuals. Principal investigators are required to present their proposal or progress.	Convened panel
Type III: Document Review	The review consists of at least three individuals who will perform a document review.	Letter review
Type IV: Competing Submissions	This type includes the review of new starts, grant submissions, and others that require an assessment of competing proposals.	Convened panel or letter review